Investigating teachers' practices of using games in school: A pattern-based approach

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ABSTRACT

We introduce teachers' practice patterns as a possible way to enhance knowledge building about game use in schools. We developed patterns through critical incident interviews with 15 Estonian school teachers and validated them in an online forum. We present the patterns, experiences around employing the approach for knowledge building and report some general themes on game use in schools that have emerged from this work.

Keywords

game-based learning; practice patterns; knowledge building;

1. INTRODUCTION

Despite large investments, the adoption of technology in schools has not been as successful as expected, although recent studies [5], [12] suggest that the change in practices is happening, albeit slowly. In this paper, we use game-based learning as a context to study games adoption by teachers and how to enhance it.

In order to improve teachers games adoption, teachers need to adapt their teaching practices and improve their skills of using ICT. It has been shown that collaborative and informal learning is the main route for professionals to improve their skills and adopt their practices [8]. Online learning communities where teachers can share knowledge about their practices and experiences therefore emerge as an attractive alternative to traditional face-to-face training courses. Online learning communities enable sharing of experiences and knowledge building with a clear focus on practice and collaboration [5]. How to enhance and scale knowledge sharing in potentially large online teacher communities is subject to extensive research. In this paper, we therefore propose to use patterns about game use practices in order to enhance knowledge sharing in such settings.

2. SHARING KNOWLEDGE ABOUT USING GAMES IN SCHOOLS

2.1 Sharing knowledge in online communities

To foster the adoption of any innovation in schools, such as game-based learning, teachers need to adopt new practices. We need to build a tool for teachers that makes adoption easier. Bottom-up online communities and networks are an important source of professional development [9] and participation in networks and communities can stimulate teachers' critical reflections on their practice and further their inquiry into new methodologies, resources or educational theories [9]. Informal online communities and networks offer teachers the possibility of voluntary engaging in shared learning, reflecting about teaching practice and receiving emotional support.

The way that knowledge has been formed in such communities has been characterized as Knowledge building [7]. Individuals contribute with their own knowledge to a shared artefact in a social system. While this leads to the building of collective knowledge, individuals themselves learn from others' contributions. The result is a dynamic interplay or co-evolution of the cognitive and social systems.

2.2 Using patterns for knowledge sharing

A pattern is a proven solution to a recurring design problem [2]. Patterns have been extensively used for capturing and sharing experiential knowledge in the design process, such as in software design and engineering [2]. In particular, game-based learning research has proposed a number of design patterns [6] [11] [14]. However, most of this work of using patterns for games has not sufficiently considered current practices of teachers in schools. According to Goodyear [4] developing new practices involves a tight integration and co-construction of experiential with theoretical knowledge. It is therefore critical to build on existing practices of teachers in their use of games. Mor [10] call these practice patterns to differentiate them from the design patterns.

In the next section, we will describe a method to map current practices of teachers' use of games by means of a qualitative research among Estonian teachers. We used the Critical Incidents Technique (CIT) to uncover their current practices and then generalized and formalized these incidents into practice patterns to make them more widely shareable amongst the teacher community.

3. METHOD

Designed based research [8] is used to closely involve teachers and other stakeholders into the research process. Two phases of contextual inquiry and co-design are used to build trust and to improve chances for adoption. In our particular case we used critical incident technique and interviews with teachers to uncover their current practices of using games in their classrooms. In the co-design phase, then, generalized patterns were developed with the teachers and later validated with a larger set of respondents (see also Goodyear for a similar approach).

3.1 Critical Incident Technique Interviews

The sample of teachers was accessed by an e-mail sent to all schools in Tallinn, Estonia. The e-mail asked to be sent to teachers who use games in their work. In total, 16 teachers contacted the author and agreed to take part in an in-depth interview, with one canceling the meeting.

We used Critical Incident Technique (CIT) for interviewing the teachers because CIT is an appropriate qualitative research tool used for gaining an understanding of the nature of a specific real world job and classroom settings. It is particularly well suited for examining events considered to be examples of success or failure [13].

These 15 CIT interviews were held after classes in the teachers classrooms and recorded using voice recorders. Teachers were asked to talk about only one instance of their game use experience (Q: "Please describe your game use instance as detailed as possible", "What was positive and negative about this game use?", "What is the effect of the game use?"). Teachers were very eager to talk about their experience and proud of their game use. They considered themselves as innovative and technically savvy teachers.

3.2 Patterns

We used this approach because design patterns hold a powerful promise for recording, calibrating and collaboratively refining expert knowledge [1] and patterns are also often employed to capture and share experiential knowledge. Identifying the underlying patterns can help understand the strengths an weaknesses of existing games and the ways in which they are used [11]. So we looked into the current came use practices with interviews. The 15 interviews with teachers were automatically transcribed and these transcriptions were qualitatively analyzed using NVivo software for making nodes at the beginning. The first step was to identify similarities and the differences of game use instances. Through several iterations the instances were grouped and we arrived at stable set of 12 patterns with some patterns having several examples. These patterns were described with name, example, context, problem and solution.

3.3 Validation

The purpose of validation was to clarify that the essence of the interviews was correctly captured and turned into patterns. First, a Google Groups forum was made with the short descriptions of 12 emerged patterns. A link to this forum was sent to some of the original respondents for feedback. They confirmed that these are the practices that teachers use and suggested to introduce these to novice teachers.

Second step of validation was to introduce these patterns to a lager audience of teachers. The Google Groups forum was shared with Estonian teachers (https://goo.gl/krVsm8).

They were asked to read, comment and add their own practice patterns.

4. RESULTS

4.1 Extracted Patterns

The short description of the patterns are in table 1. The full patterns with more explanations can be found https://goo.gl/j9oxyt
Each pattern has a unique name (first column), a problem that it is addressing and a solution how this problem is solved. In the last column there is an example or examples of this pattern being used.

The most typical problem that the teachers were trying to solve with using games was to get the students attention, to do something not boring for them. Some of the teachers also mentioned that games have negative perceptions among some parents and even school management. Others mentioned that they would use more games but finding the suitable ones is time-consuming. Most teachers try the games themselves before they give them to the students, to be sure how is it played, what is the content and how long does it take. Other teachers use games that are readily made and suggested by other colleagues. So the examples provided in the pattern format have a wide range of classroom situations like individual work, group work, taking turns and competition etc. Also different domains are represented including mathematics, literature, coding, language etc.

In the forum the most viewed pattern was "Educational game portals" with 126 views, "Role playing in literature" with 112 views and "Quiz" had 109 views. New examples were added to Practicing (for learning musical notes), Programming (code.org) and Role playing (in history class). Other comments were about the possibility of students creating their own games more. No new patterns were added by the readers.

4.2 Overarching themes in game use

Besides the patterns, there were some overarching themes we identified across all interviews. The main themes were teacher neutrality, motivation, engagement, alternation and excitement/joy. These link the research to many active topics in game based research.

Joy - 14 teachers out of 15 mentioned that the students and themselves play for fun and excitement ("It is a good day when I have made their eyes sparkle", "It is also fun and educating for me, as a teacher).

Alternation - 11 teachers said that games are good for alternating the daily routine ("It is good to bring the children out of the daily routine", "This gives the opportunity to make the teams in such a way that everybody can feel success for a change").

Engagement - Engagement was mentioned 8 times. Students get engaged with the topic when they are playing, they are so absorbed that they can go on for hours ("They want to come to school and class","When the bell rings but they still want to stay and keep playing and learning").

Motivation - 7 teachers mentioned that playing itself is motivating for the students ("If there is a competition, it can add extra motivation", "They are waiting for it: "Can we play today?"").

Teacher neutrality - Five teachers mentioned that they use games because computer gives neutral and private feedback.

Table 1: Teachers game use practice patterns

Pattern	Problem	Solution	Example
Role playing in literature	It is hard for the students to remember theoretical/textual and factual materials.	Experiental education enables students to participate directly in the learning content.	To make literature more interesting and help students memorize the facts, it is very effective to use role playing in literature class.
Alternative activity	Sometimes it happens that the assignment with computers that teacher has planned for class does not work.	To spend their time in an educative way is to use a Jeopardy game.	There are a lot of Jeopardy like games online or the students can compose these games by themselves.
Educational games portals	Children are audiovisuals and they need alternation of same type of information.	Portals that provide multiple different types of games and quizzes and the ability to create your own games, are a good solution.	Learningapps.org
Programming	Coding is hard and boring to learn.	Using visual coding to create games brakes the routine.	www.kodugamelab.com
Practicing/drilling	There are a lot of skills that need to be automated.	Using different games and portals to vary the drilling keeps students motivated and engaged.	MathFights.com, 10Monkeys.com, Internet4classrooms.com
Computer made decisions	Students often consider the teacher as biased or subjective.	A computer program can eliminate the problem of teacher bias. Using computer programs to select students or questions, form groups makes students more happy.	Tripticoplus.com
Gamefying with Quiz	Students are passive, especially in theoretical subjects.	Gamifying is one way of making studies more interesting, exiting and fun. Using a quiz makes students more actively engaged in the topic.	Quizes
Whole class interactive activities	SmartBoards or projectors usually enable playing games for one student at the time. The problem is to engage the whole class with the same activity.	Using portals that enable students to use their own mobile devices as remotes engages and motivates students at any level.	Kahoot.it
Combining activities with moving	Usually most classes make students sit down and focus on one task at hand.	Creating games that allow students to move during classes has many benefits. If you combine it with memorizing it develops students memory.	Relay race. Combining mathematics and relay race you enable the students to move while learning and drilling their memory.
Sense of Unity	The feeling of unity is hard to develop in students.	Taking time to give individual attention to each student creates a feeling of unity and trust.	Morning circle - students gather in a circle and look each other in the eye.
Lifelike situations	Books have limited information and they lack of lifelike situations.	Using role-playing to practice dialogues makes these situations more life-like.	Role-playing dialogues in English.
Board games in class	Students need to be motivated to learn, behave and get through the day.	Board games are motivating as is. They can be used as a reward to get through the day or as learning tools.	Apples to Apples

Students don't argue with the computer ("There they are not afraid to make mistakes", "Computer does, this means that everything is correct").

5. DISCUSSION

We know that teachers are struggling with ICT use in schools. It is often the case when policy changes are introduced top down, and it is overlooked that the teachers are the true change agents in schools in terms of modes of education [3]. We addressed teachers and their practices to map the current situation of game use in schools. We extracted and validated some occurring practice patterns. These patterns are not exhaustive list of practices but they are a good examples of actual cases. In order to enrich the patterns with more examples and to share these more effectively, our goal is to develop a platform. The next step is to build a tool that enables a wider distribution of the patterns to teachers for trying them out in their own context. By seeing for themselves the positive impact on students' learning, their motivation, attitudes and propensity for change are influenced. This appears to be particularly important for the pedagogical use of ICT, where practical use of technology in the classroom can help teachers make the transition from developing skills in ICT to mastering competence in the pedagogical use of ICT [5]. Practices that present strategies for teaching, introduce new ideas and techniques, and require active participation are, in general, highly valued by teachers [9].

Importantly, teachers also receive social support and encouragement, when practice patterns are shared and more widely discussed. While the question of whether the patterns are effective for knowledge building to take place remains subject of further research, we received initial encouraging results. Teachers were quite comfortable to share their experiences around game use with coworkers or in an online educational portal (koolielu.ee). The first validation also shows that teachers were interested in others' experience as our logs showed several other teachers browsing and comment the initial patterns. Also, several additional examples for patterns were mentioned, but no new patterns were suggested. We assume this is the case as the generalization of experiences into patterns is a task that requires more extensive collaborative design and co-construction.

6. CONCLUSIONS AND FUTURE WORK

The next step in our research will be to develop a platform through which social practices around adoption and applications can be shared by teachers. The tool should enable online collaborative knowledge building as teachers continuous professional development. In order to make teachers adopt game-based learning, the tool needs to enable active and passive participation and social sharing. In order to build such a community platform we have taken the fist step by mapping, generalizing and validating the current practices.

7. ACKNOWLEDGMENTS

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